IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of: TSUKAMOTO, Katsumi

Serial Number: 09/913,157

Filing Date: August 10, 2001

Title: Cell Switching Device and Cell Switching Method

Group Art Unit: 2686

Examiner: Contee, J.

Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF
Pursuant to 37 C.F.R. § 41.37

SIR:

Appellant respectfully submits this Appeal Brief in response to the Office Action mailed on January 14, 2005, finally rejecting each of the pending claims 1–11. The Notice of Appeal was filed on June 13, 2005, and this Appeal Brief is timely filed.

An Advisory Action was mailed on May 13, 2005.

This application is a National Stage Entry of PCT/JP00/00050, which has an international filing date of January 7, 2000, designated the United States and was not published in English.

I. Real Party in Interest

The real party in interest is Mitsubishi Denki Kabushiki Kaisha of 2-3, Marunouchi 2-chome, Chiyoda-ku, Tokyo 100-8310 Japan. *See*, Assignment (recorded August 10, 2001 at reel 012235, frame 0955).

II. Related Appeals and Interferences

There are no related appeals or interferences.

III. Status of Claims

Claims 1–11 are pending in this application. Claims 1, 2 and 6–8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,898,926 to Konishi ("Konishi") in view of U.S. Patent No. 5,634,206 to Reed et al. ("Reed"). Claims 3, 4, 9 and 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Konishi in view of Reed and in further view of U.S. Patent No. 5,649,319 to Kimura et al. ("Kimura"). Claims 5 and 11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Konishi in view of Reed and in further view of U.S. Patent No. 6,369,754 to Levanon ("Levanon"). Konishi and Reed are the primary references upon which the rejections are based. This appeal is from the final rejection of claims 1–11.

IV. Status of Amendments

Claims 1–11 were amended in a Response filed on June 28, 2004, and Claims 1–6 were amended in a Response under 37 C.F.R. § 1.116 filed on April 11, 2005. The Claims Appendix (Section VIII) sets forth all pending claims in their current form.

V. Summary of Claimed Subject Matter

The present invention is directed, generally, to cellular communications systems and, more particularly, to a device and method for switching between adjacent base stations.

A. Independent Claim 1

Claim 1 is directed to a device for switching between adjacent base stations. A field intensity measuring unit measures the field intensity of various signals received from each of a plurality of base stations adjacent to a base station servicing a mobile station. A switching unit receives the results of the measurements provided by the measuring unit device, and, when the field intensity of a measured base station exceeds a reference intensity, switches to that base station for communication with the mobile station. A control unit adjusts a field intensity measurement time interval, in the measuring unit, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations measured by the measuring unit.

B. Independent Claim 7

Claim 7 is directed to a method for switching between adjacent base stations. The field intensity of signals from a plurality of base stations adjacent to a base station servicing a mobile station is measured and, when the field intensity of a measured base station exceeds a reference intensity, the mobile station is switched to that base station for communication. The field intensity measurement time interval, with respect to the base stations, is controlled, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations.

The various elements of the cell switching device and method will be described with reference to Figures 1–5 and Table 1 below, which correspond to FIGS. 6–10 and FIG. 11, respectively, of this application.

In cellular communications systems, mobile cellular devices communicate with base stations using radio signals transmitted over a range of frequencies, or channels. Each base station may define a "cell," which is a specific geographic area serviced by that particular base station. Terrestrial-based systems typically deploy base stations in a mutually-interlocking geographical arrangement, with different channels assigned to adjacent base stations. Celestial-based systems typically employ a constellation of satellites having overlapping terrestrial footprints. While both types of cellular communication networks are described and claimed by this application, a terrestrial-based system, having fixed base stations, will be discussed herein.

Typically, the servicing of a particular mobile cellular device is switched, from a host cell to an adjacent cell, when the host base station's signal strength falls below a minimum threshold. Also known as handoff, various methods have been proposed to control this critical process. For example, one known method successively measures the intensity of the signals received from the adjacent base stations at a particular measurement time interval, i.e., sampling rate, and then reduces the measurement time interval, i.e., increases the sampling rate, if the received signal from the host base station falls below a certain threshold. Handoff then occurs when the received signal from the host base station falls below the minimum threshold.

However, because base stations located farthest from the mobile cellular device will not receive the handoff due to low signal strength, frequent measurement of the signals received from these base stations inefficiently consumes mobile cellular device power.

See, e.g., Application at Pages 1–5; FIGS. 1–3.

Figure 1 depicts several representative cells from a cellular communications system, i.e., cells "A" through "G", each having a respective base station. Using the center of cell "A" as a starting point, when mobile cellular device "a" moves towards cell "C", the measured field intensity of base station "C" gradually increases, while the measured field intensity of base station "A" gradually decreases. Similarly, the measured field intensities of base stations "B" and "D" gradually increase, to a lesser degree, while the measured field intensities of base stations "E", "F" and "G" gradually decrease in varying proportions.

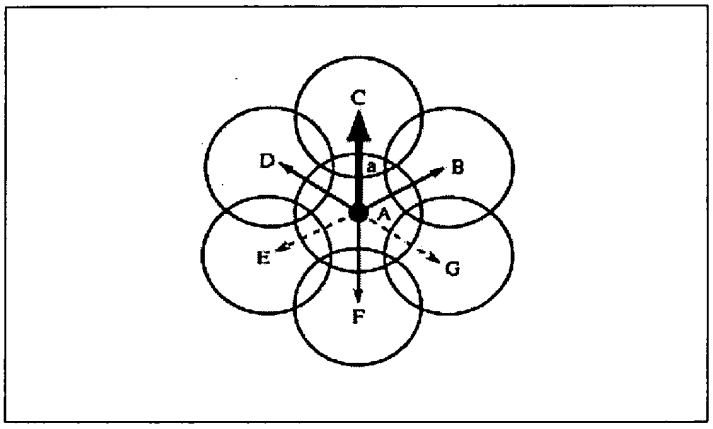

Figure 1

In the present invention, the time interval for field intensity measurement, i.e., the field intensity sampling rate, is individually adjusted for each base station based on whether the measured field intensity for that particular base station tends to be increasing or decreasing. Selective base station field intensity measurement permits the power consumption on the mobile device to be advantageously controlled. The width of the arrows emanating from the center of cell "A" in Figure 1 represent the relative frequency of field intensity measurements, or field intensity sampling rates, for each adjacent cell, i.e., base stations "B" through "G". Figures 2–5 depict base station field intensities over time as mobile cellular device "a" moves from the center of cell "A" towards cell "C". Exemplary time intervals for field intensity measurements, based on measured field intensity tendencies, are tabulated in Table 1.

TENDENCY \ ABSOLUTE VALUE	BELOW L	EQUAL TO OR GREATER THAN L
+20%~ (NOT INCLUDING 20.0)	t_2	t_1
0~20%	t_4	t_3
-20~0%	t_6	t_5
~-20% (NOT INCLUDING -20.0)	t_8	t_7

$t_1, t_2, t_3, t_4, t_5, t_6, t_7, t_8$ INDICATE TIME INTERVALS FOR MEASUREMENTS
$t_1 < t_2 < t_3 < t_4 < t_5 < t_6 < t_7 < t_8$

Table 1

As shown in Figure 2, the field intensity for base station "F" decreases sharply such that a long measurement time interval is chosen. Only a single measurement is depicted, at time "1". Figure 3 depicts the field intensities for base stations "E" and "G", which decrease at a more gradual rate such that a somewhat shorter measurement time interval is selected. Two measurements are shown, at times "1" and "3".

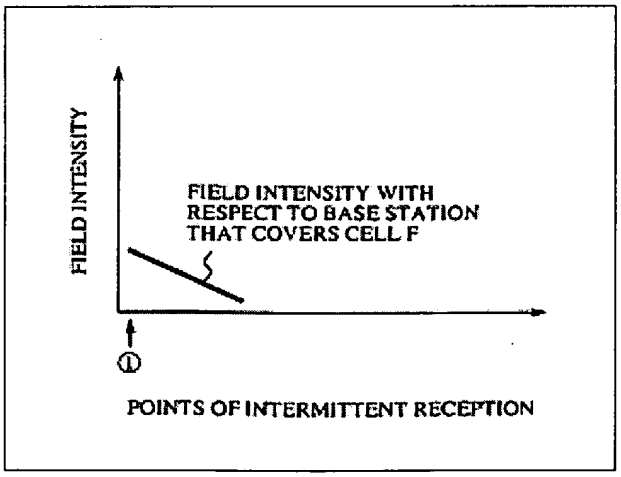

Figure 2

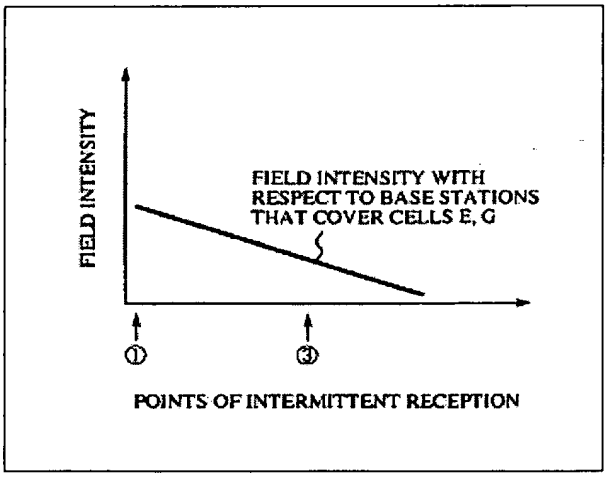

Figure 3

Figure 4 presents the field intensities for base stations "B" and "D", which increase at a gradual rate such that a short measurement time interval is chosen. Four measurements are shown, at times "1", "3", "6" and "9". Figure 5 depicts the field intensity for base station "C", which increases at a sharp rate such that the shortest measurement time interval is selected. Five measurements are shown, at times "1", "2", "3", "4" and "5". In other words, the

measurement sampling rate for each base station depends upon the tendency of that base station's field intensity to increase or decrease.

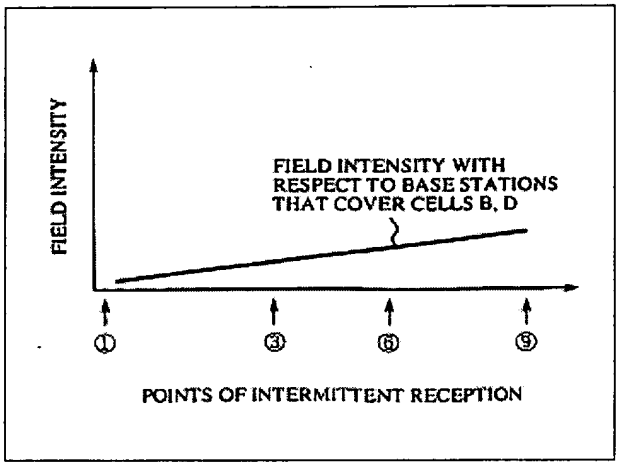

Figure 4

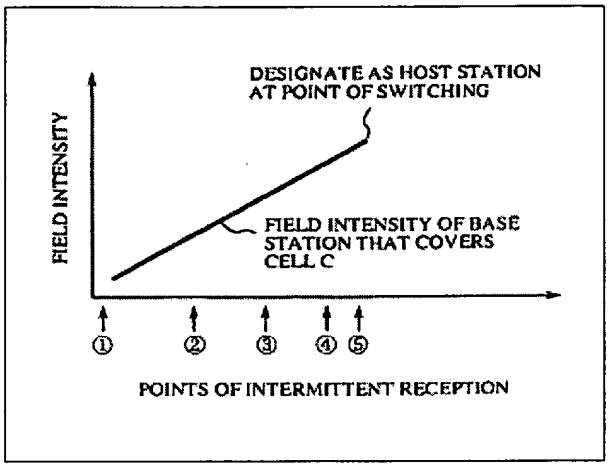

Figure 5

See, e.g., Application at Pages 11–14; FIGS. 7–11.

VI. Grounds of Rejection to Be Reviewed On Appeal

A. Whether Claims 1, 2 and 6–8 patentably distinguish over Konishi in view of Reed under 35 U.S.C. § 103(a).

B. Whether Claims 3, 4, 9 and 10 patentably distinguish over Konishi in view of Reed and in further view of Kimura under 35 U.S.C. § 103(a).

C. Whether Claims 5 and 11 patentably distinguishes over Konishi in view of Reed and in further view of Levanon under 35 U.S.C. § 103(a).

VII. Argument

The present appeal turns on the proper reading of the primary references, Konishi and Reed. The Appellant respectfully submits that the Examiner has based his rejections upon an inappropriate construction of the pending claims. When properly construed, it becomes clear that the claimed invention includes fundamental elements not disclosed by Konishi, Reed or any other cited reference.

A. A Brief Description of Konishi

Konishi is directed to channel switching system for high speed mobile communications. Konishi discloses that a handoff from a host base station to an adjacent base station depends upon the speed of the mobile device. Konishi's FIG. 1, reproduced as Figure 6 below, depicts the path traveled by a mobile device, starting from a cell serviced by base station 1, through an adjacent cell serviced by base station 2, to a destination cell serviced by base station 3.

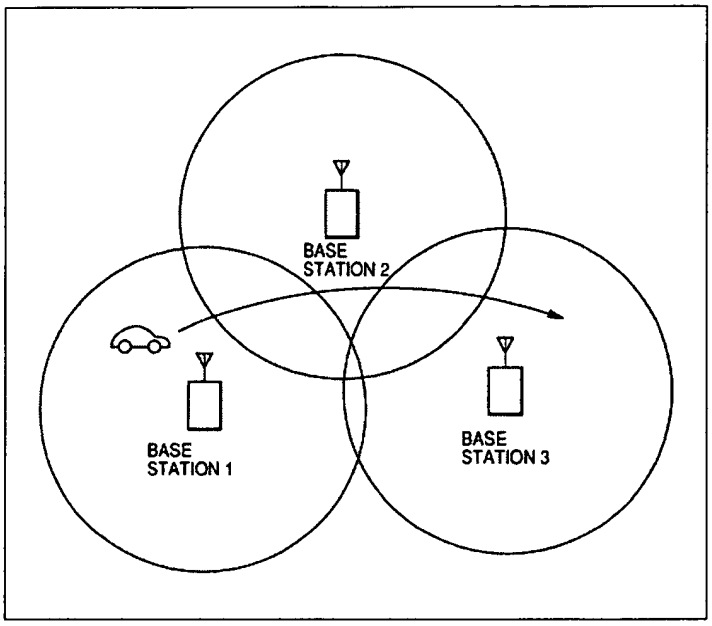

Figure 6

Konishi teaches that it is preferable to handoff the mobile device to base station 2 when the mobile device is proceeding at a slow speed, e.g., movement on foot, but to handoff the mobile device directly to base station 3 when the mobile device is proceeding at a high speed, e.g., vehicular movement.

See, e.g., Col. 5, lines 1–16; FIG. 1.

Konishi's portable terminal 10 includes controller 30, which monitors changes in the current base station's electric field intensity to determine whether the portable terminal 10 is moving at a high speed or a low speed. If controller 30 determines that the mobile terminal is moving at a low speed, then handoff is accomplished "by usual means" when the current base station's electric field intensity falls below a reference value. However, if controller 30 determines that portable terminal 10 is moving at a high speed, then electric field intensities of

the surrounding base stations are "collected periodically," stored and compared to determine which adjacent base station's electric field intensity shows the largest increase (rather than the largest value). Handoff to the base station having the largest increase in electric field intensity proceeds when the current base station's electric field intensity falls below the reference value.

See, e.g., Col. 5, line 21 to Col. 6, line 39; FIGS. 3–7.

B. A Brief Description of Reed

Reed is directed to a method and apparatus for estimating the fading characteristic of a signal received at a wireless communications unit using a selection diversity receiver, as depicted in FIG. 3 and reproduced as Figure 7 below.

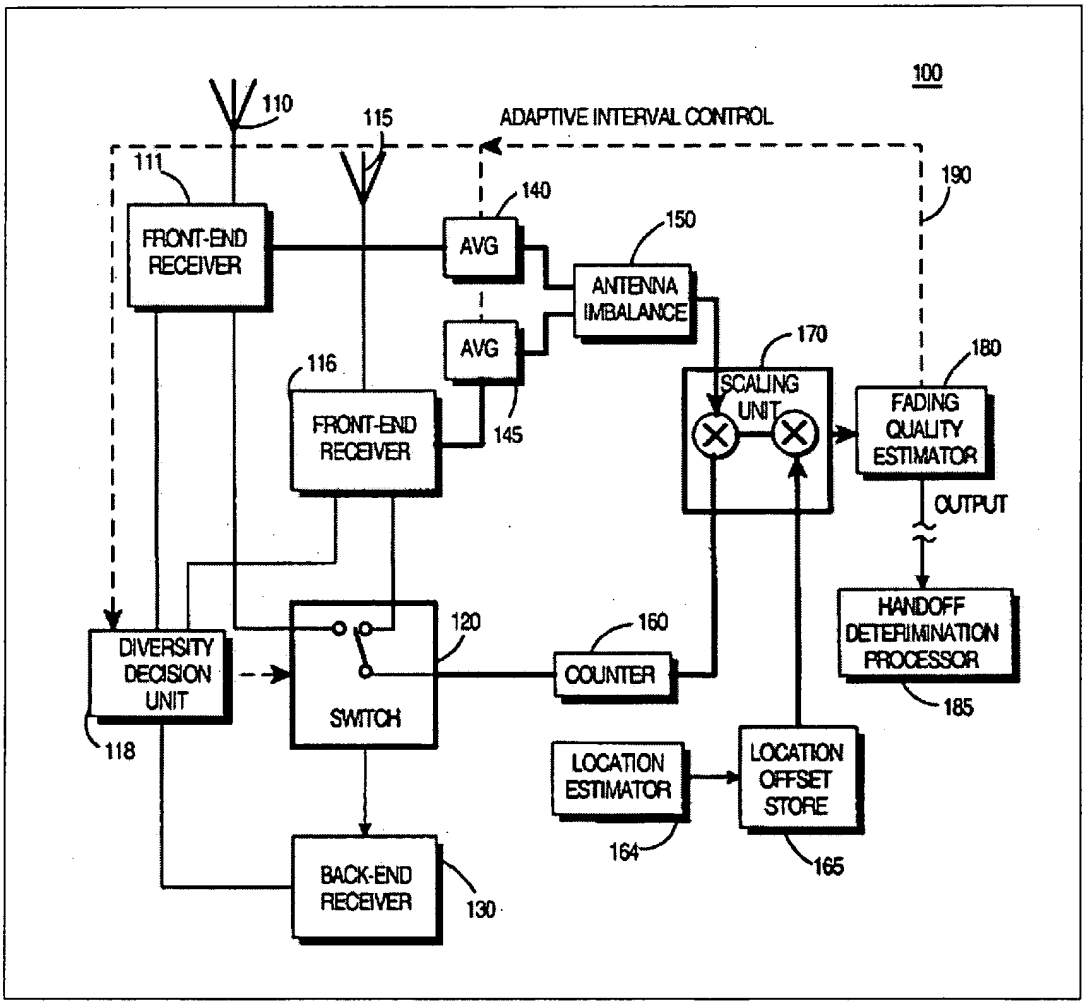

Figure 7

Reed teaches that his selection diversity receiver includes two branches that are periodically compared, in order to select the best branch for reception of the transmitted message each diversity period T_{div}. Reed's sampling rate, i.e., the rate at which signals are measured, is determined by T_{div}. "For the example of FIG. 1, which shows Rayleigh-faded signals collected by two separated (decorrelated) antennas, assuming a high (or continuous) sampling rate (small T_{div}), there are 13 transitions which occur after the first signal condition." (Col. 4, lines 58–62).

Reed discloses that communications unit 100 includes averaging units 140, 145 which calculate received signal strength (RSSI) for each respective receiver branch by averaging a number of samples together to estimate the average power on each branch. Reed's "averaging interval," which determines how many samples are averaged together, can be adjusted based on multipath fluctuation conditions. "Control line (190) shows the adaptation of the averaging intervals based on the speed estimate or difference factor. This allows small changes to be made in the number of samples that are averaged to improve the estimate of the average power on each branch." (Col. 5, lines 34–37).

See, e.g., Col. 3, line 24 to Col. 4, line 67.

C. Claims 1, 2 and 6–8 Are Patentably Distinguishable Over Konishi in View of Reed

Claim 1 is directed to a cell switching device and recites, *inter alia*, "a control unit that adjusts a time interval for field intensity measurement, in the measuring unit, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations measured by the measuring unit." Claim 7 is directed to a cell switching method and recites, *inter alia*, "controlling the time interval for field intensity measurement with respect to the base stations, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations." As discussed above, the time interval for field intensity measurement is the field intensity sampling rate, which is adjusted for each base station based on whether the measured field intensity for that particular base station tends to be increasing or decreasing. Konishi and Reed, taken either singly or in combination, fail to teach or suggest these features.

Konishi fails to disclose that the field intensity for each surrounding base station may be measured at different time intervals (i.e., different sampling rates). It follows that Konishi also

fails to teach or suggest that each base station's field intensity measurement time interval may be adjusted by taking into consideration an increasing or decreasing tendency of the field intensity with respect to that particular base station, as recited by Claims 1 and 7. The Examiner recognizes this deficiency in Konishi with respect to Claims 1 and 7.

> Konishi fails to disclose: a control device that adjusts a time interval for field intensity measurement, in the measuring device, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations measured by the measuring unit.
>
> Office Action at Page 3, Paragraph 3[1].

In order to overcome this deficiency, the Examiner alleges that Reed discloses these features, and, more particularly, that these claim elements "read on" Reed's teaching of adjusting the average interval to get accurate measures of RSSI under various conditions. *See,* Office Action at Page 3, Paragraph 4[2]. The Examiner, however, is mistaken.

As discussed in Section V, the claimed "time interval for field intensity measurement" is a sampling rate, not an averaging interval as alleged by the Examiner. Reed fails to disclose that his sampling rate (T_{div}) may be adjusted. It follows that Reed also fails to teach or suggest that the time interval for field intensity measurement may be adjusted by taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations, as recited by Claims 1 and 7.

It is apparent that the Examiner has misconstrued the claimed "time interval for field intensity measurement" as a time interval in which samples are averaged together, i.e., Reed's averaging interval, rather than a time interval in which samples are measured, i.e., Reed's sampling rate as determined by T_{div}. Reed's averaging interval determines the number of samples that are averaged together, in each branch, in order to improve the estimate of the average power within each branch of his diversity receiver. *See,* e.g., Col. 5, lines 34–36. Reed clearly distinguishes between these two time intervals, and, as discussed in Section VII.B, Reed clearly teaches that his sampling rate is determined by his diversity period, T_{div}. *See,* e.g., Col. 4, lines 58–62. Consequently, the Examiner's reliance upon Reed's disclosure, particularly as it relates to adjustment of the averaging interval, in entirely misplaced.

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[1] *See also,* Advisory Action at Page 7, Paragraph 2.

[2] *See also,* Advisory Action at Page 7, Paragraph 3.

Accordingly, because none of the cited references, taken either singly or in combination, teach or suggest all of the features recited by independent Claims 1 and 7, these claims are allowable. Furthermore, claims 2–6, depending from claim 1, claims 8–11, depending from claim 7, are also allowable, at least for these reasons.

D. Claims 3, 4, 9 and 10 Are Patentably Distinguishable Over Konishi in View of Reed and in Further View of Kimura

As discussed in Section VII.C, Konishi and Reed fail to teach or suggest "a control unit that adjusts a time interval for field intensity measurement, in the measuring unit, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations measured by the measuring unit," as recited by Claim 1, or "controlling the time interval for field intensity measurement with respect to the base stations, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations," as recited by Claim 7.

Kimura is directed to a receiver with automatic tuning and fails to teach or suggest these features. Accordingly, Claims 3 and 4, depending from Claim 1, and Claims 9 and 10, depending from Claim 7, are allowable at least for the reasons discussed above.

E. Claims 5 and 11 Are Patentably Distinguishable Over Konishi in View of Reed and in Further View of Levanon

As discussed n Section VII.C, Konishi and Reed fail to teach or suggest that "a control unit that adjusts a time interval for field intensity measurement, in the measuring unit, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations measured by the measuring unit," as recited by Claim 1, or "controlling the time interval for field intensity measurement with respect to the base stations, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations," as recited by Claim 7.

Levanon is directed to a method for finding the location of a user terminal in a satellite communications system and fails to teach or suggest these features. Accordingly, Claim 5, depending from Claim 1, and Claim 11, depending from Claim 7, are allowable at least for the reasons discussed above.

F. Summary

In view of the above, the Appellant submits that all of the claims on appeal distinguish over the prior art of record. Accordingly, the Appellant respectfully requests that the Board of Patent Appeals and Interferences reverse the Examiner's rejection of claims 1–11 and direct the Examiner to pass the case to issue.

A check in the amount of $500 is submitted herewith for the appeal brief fee.

The Commissioner is hereby authorized to charge any additional fees which may be necessary for consideration of this brief to Deposit Account No. 02-2135. A copy of this sheet is enclosed for this purpose.

Respectfully submitted,
Rothwell, Figg, Ernst & Manbeck P.C.

August 12, 2005

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VIII. Claims Appendix

1. A cell switching device comprising:

a field intensity measuring unit that measures a field intensity of signals from each of a plurality of base stations adjacent to a base station servicing a mobile station;

a switching unit that receives results of the measurements provided by said measuring unit device, and, when the field intensity of a measured base station exceeds a reference intensity, switches to that base station for communication with the mobile station; and

a control unit that adjusts a time interval for field intensity measurement, in the measuring unit, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations measured by the measuring unit.

2. The cell switching unit according to claim 1, wherein said control unit reduces the time interval for field intensity measurement with respect to a base station as the field intensity undergoes an increase, and extends the time interval for field intensity measurement with respect to the base station as the field intensity undergoes a decrease.

3. The cell switching unit according to claim 1, wherein said control unit controls the time interval for field intensity measurement with respect to the base stations, taking into consideration absolute values of field intensity with respect to the base stations.

4. The cell switching unit according to claim 3, wherein said control unit reduces the time interval for field intensity measurement with respect to a base station as the absolute value of field intensity with respect to the base station becomes large.

5. The cell switching unit according to claim 1, wherein said control unit controls the time interval for field intensity measurement with respect to a base station, taking into consideration a direction of movement of a satellite.

6. The cell switching unit according to claim 1, wherein said control unit is provided in the base station servicing the mobile station.

7. A cell switching method comprising the steps of:

measuring a field intensity of signals from a plurality of base stations adjacent to a base station servicing a mobile station;

switching, when the field intensity of a measured base station exceeds a reference intensity, to that base station for communication with the mobile station; and

controlling the time interval for field intensity measurement with respect to the base stations, taking into consideration an increasing or decreasing tendency of the field intensity with respect to the base stations.

8. The cell switching method according to claim 7, wherein:

the time interval for field intensity measurement with respect to a base station is reduced as the field intensity undergoes an increase, and the time interval for field intensity measurement with respect to the base station is extended as the field intensity undergoes a decrease.

9. The cell switching method according to claim 7, wherein:

the time interval for field intensity measurement with respect to the base stations is controlled, taking into consideration absolute values of the field intensity with respect to the base stations.

10. The cell switching method according to claim 9, wherein:

the time interval for field intensity measurement with respect to the base station is reduced as the absolute value of field intensity becomes large.

11. The cell switching method according to claim 7, wherein:

the time interval for field intensity measurement with respect to the base stations is controlled, taking into consideration a direction of movement of a satellite.

IX. Evidence Appendix

Not applicable.

X. Related Proceedings Appendix

Not applicable.

AF/# 2200

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	: 09/913,157
Applicant	: Katsumi Tsukamoto
Filed	: August 10, 2001
TC/A.U.	: 2686
Examiner	: Joy K. Contee
Docket No.	: 1137-827
Customer No.	: 06449
Confirmation No.	: 3642

TRANSMITTAL OF APPEAL BRIEF

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Alexandria, Virginia 22313-1450

Dear Sir:

Enclosed in connection with the above-referenced application is an Appeal Brief with Appendix. A check is enclosed to cover the following fees: $500.00 to cover the fee for filing the Brief in support of a Notice of Appeal.

Also, please charge any additional fees or credit any overpayment to Deposit Account No. 02-2135. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

By _____

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Enclosure(s): Appeal Brief